Congressional Notification Profile
DE-PS26-02NT41369

UNIVERSITY COAL RESEARCH PROGRAM, INNOVATIVE CONCEPTS PROGRAM
University of Nevada

Background and Technical Information:
Project Title: "Advanced Heat Exchangers Using Nanoscale-Molecular Assembly."

This project proposes to develop a novel steam condenser using nano-tailored heat exchange surfaces to resolve problems that compromise the performance of large-scale coal plants. Thin films of hydrophobic molecules will be applied to metal tubing surfaces, creating a protective, stronger bond that resists water and allows tubes and other components to last longer than standard equipment. Thermal efficiency of the new components will be tested.

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Congressional District: 02 District County: Washoe

Financial Information:

Length of Contract (months): 12
Government Share: $49,984
Total value of contract: $49,984

DOE Funding Breakdown:
Funds: FY 2002 $49,984

ABSTRACT

The Title of the Project: **Advanced Heat Exchangers Using Nanoscale-Molecular Assembly (for UCR Innovative Concepts Phase I Program)**

Sponsoring Organization: U.S. Department of Energy, National Energy Technology Laboratory

Proposed by: University of Nevada, Reno

University of Nevada, Reno (UNR) has in place a team, Professor Kwang J. Kim of Mechanical Engineering Department and Professor Thomas W. Bell of Chemistry Department, who have extensive experience in 1) design and testing of condensation heat transfer, and 2) nanoscale-molecular synthetic chemistry. These experiences are directly applicable to the research identified in DOE's Program Solicitation, DE-PS26-02NT41369, under the University Coal Research (UCR) Innovative Concept Phase-I Program.

The current coal industry continues to encourage a competitive environment in the energy market place. In order to promote coal utilization, considering environmental constraints and CO_2 emission, the condenser technology should be improved. One key technical challenge is to significantly improve the condenser heat transfer efficiency.

The major objective of the proposed research effort is to develop an innovative steam condenser technology using nano-tailored heat exchange surfaces that have a large potential to resolve steam condenser-related problems that cause substantial losses of performance in large-scale coal power plants. This research will produce an important technology that has low cost consumer potential. The objective will be achieved via the following three tasks:

Task 1. Fabrication of Nano-Tailored Heat Transfer Surfaces. We will develop an effective process to coat nano self-assembled monolayers on metal tubing materials, i.e. cupper or cupper oxide, to tailored their desirable surface properties. Important considerations are: 1) contact angles of the condensate; 2) long-term durability of nano self-assembled monolayers; and 3) their manufacturing cost.

Task 2. Thermal Characterization – Steam Condensation. First, the steam condensation facility will be built based on an internally cooled, single horizontal tube geometry that can provide a convenient method to evaluate different condenser tubes. Second, the fabricated condenser tubes with nano self-assembled monolayers will be tested for their thermal performance.

Task 3. Report and Recommendation for Future Study. As specified in the original solicitation, the University of Nevada, Reno, will provide a final report at the completion of the 12 month project and other documents as required by the U.S. DOE. The final report will summarize the research conducted to date, including a detailed description of the design, fabrication method, and performance data of the condenser tubes built. Based upon these results, we will recommend the future study.